Numerical Weather Prediction Readiness for NPP And JPSS

Data Assimilation Experiments for CrIS and ATMS

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1. Riverside Technology, Inc 2. Joint Center for Satellite Data Assimilation 3. University of Wisconsin 4. ERT

Outline

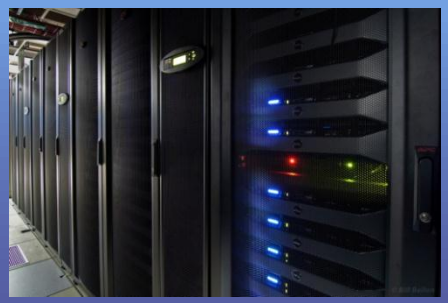
1. **JCSDA Status**
2. ATMS Radiance Assimilation
3. Forecast Impact
4. Future Work/Summary

JCSDA Status

- JCSDA / NESDIS / NCEP agreement to expedite R2O for ATMS assimilation into the GSI
- GDAS Hybrid/ENKF ported to S4 system
- Verification and Radiance Monitoring ported to S4
- JCSDA website extended for experiment visualization
- Control run and ATMS experiments run for Dec 15 – March 15
- CrIS proxy data and real data being assimilated

S4 Overview

- **Brief Technical Description**
  - The S4 system is a Linux cluster (Dell hardware)
  - 3072 CPU cores in 64 compute nodes with 8TB of total RAM
  - 520 TB in 26 storage nodes
  - Quad data rate (40 Gbps) Infiniband interconnects between all compute and storage nodes
  - Lustre high performance filesystem for scratch space (4 x 80TB) and data storage (200 TB)
  - Hosted in the UW/SSEC Data Center (with UPS)



Supercomputer for Satellite Simulations and data assimilation Studies (S4), hosted by University of Wisconsin.

- **Major activities**
  - (1) Undertake satellite data assimilation experiments at global and/or regional scales and the assessment of their impacts on forecast models skills, using currently flying satellite sensors and allowing scientists to test new science/methodology and
  - (2) In support of the activity above, undertake all necessary satellite data simulations, calibration, algorithms development/improvement, radiative transfer modeling and validation, quality control (QC) procedures, etc
  - (3) Perform Observing System Simulation Experiments (OSSEs) for new sensors (such as GOES-R and JPSS).

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Experiment Overview

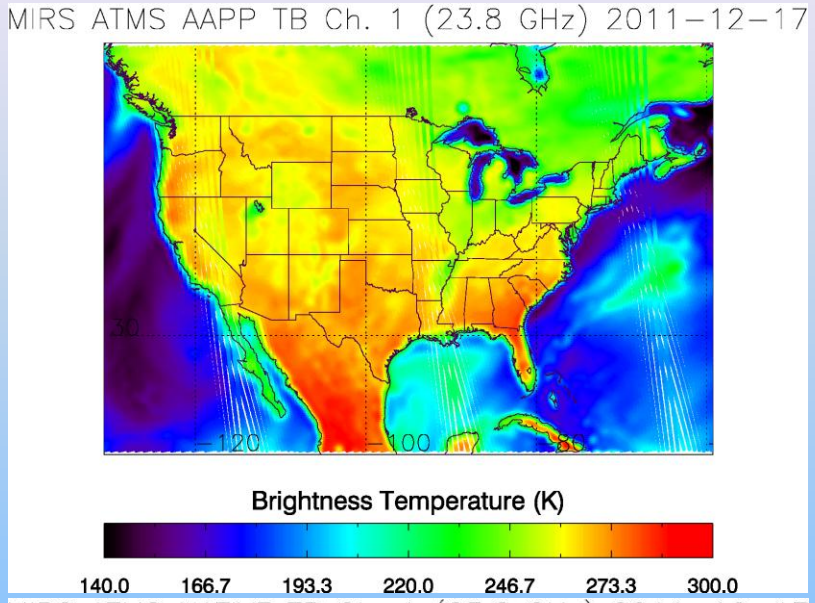
- Goal: Determine the ATMS assimilation impact on forecast
- Use updated GFS and GDAS with GSI Hybrid Ensemble Kalman Filter (ENKF)/3DVAR
  - Control run
  - ATMS run
- Forecast/analysis model resolution at T574
- 80 ensemble members during analysis at T254
- Begin Dec. 15, 2011
  - ATMS bias spun-up by NCEP
  - Allow model spin-up on S4 for 1 month of data
  - Assessment period Jan. 15, 2012 – Mar. 15, 2012

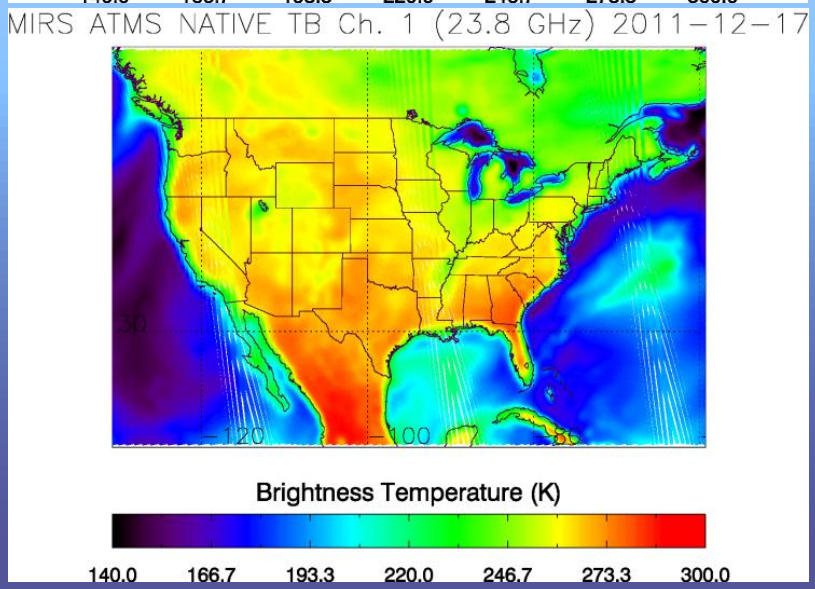
Experiment Overview

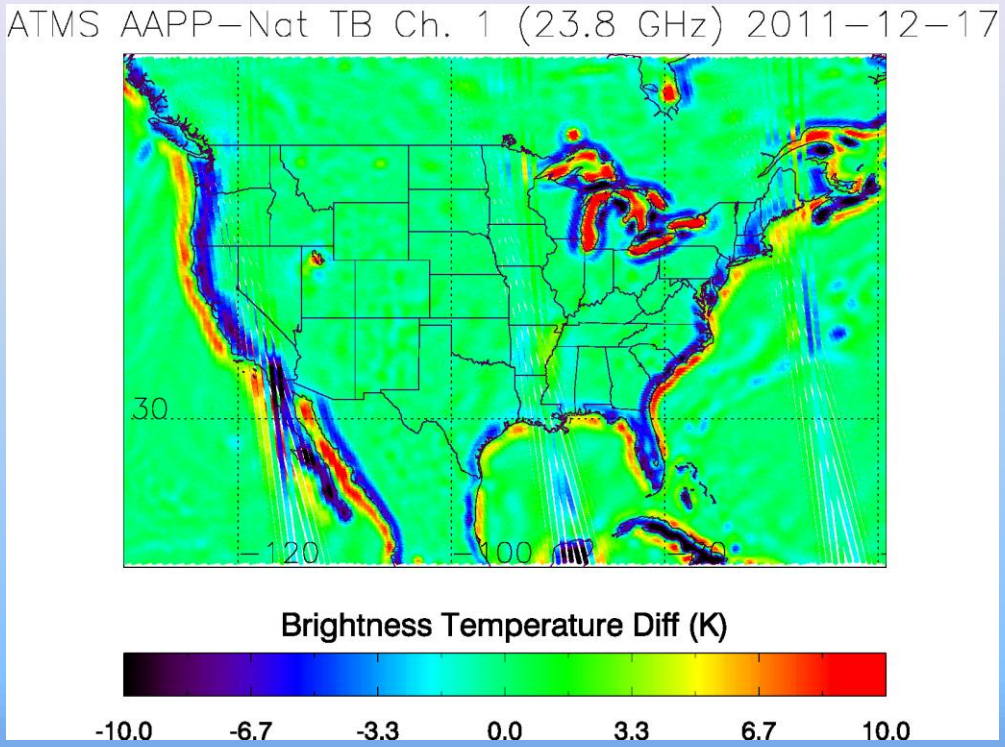
- Control run
  - Conventional data (RAOB, aircraft, ship, buoys), AMVs, surface synoptic
  - Satellite data:
    - AMSU-A (N15, N18, N19, AQUA)
    - MHS (N18, N19, MetOp-A)
    - HIRS (N19, MetOp-A)
    - IASI (MetOp-A)
    - AIRS (AQUA)
    - AVHRR (N18, N19, MetOp-A)
    - GOES Sounder (13)
    - Seviri (Meteosat 9)
    - ASCAT, WindSat

- ATMS run
  - All control obs plus NPP ATMS (TDR)
  - FOVs 1-3 and 94-96 not assimilated
  - All channels except for 15 (57 GHz)
  - All channels averaged to 3.3 beam resolution (AAPP)

ATMS Spatial Averaging



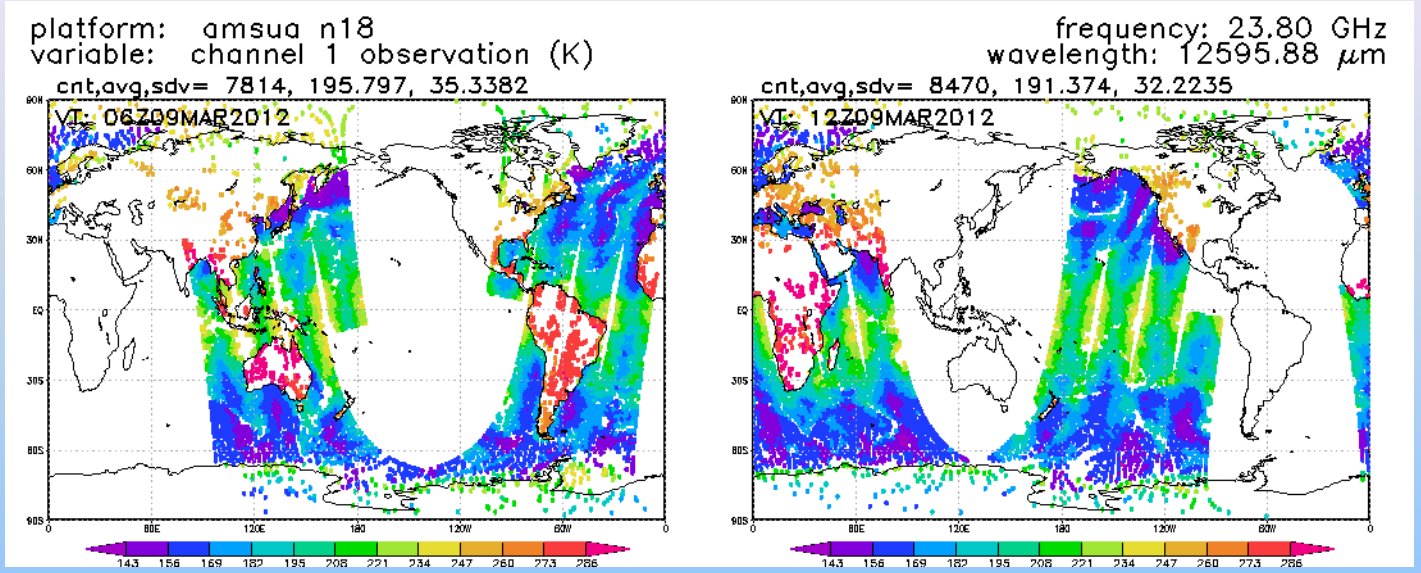




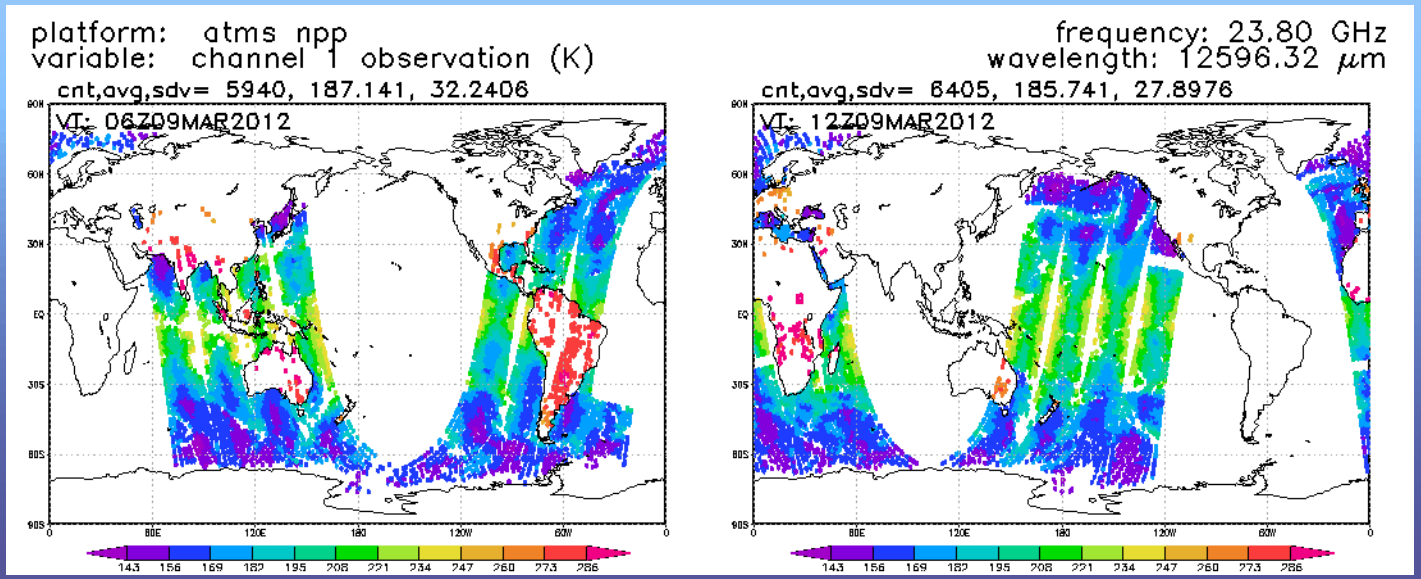
Channel 1 3.3° – 5.2°

ATMS Coverage

N18 AMSU-A 23 GHz

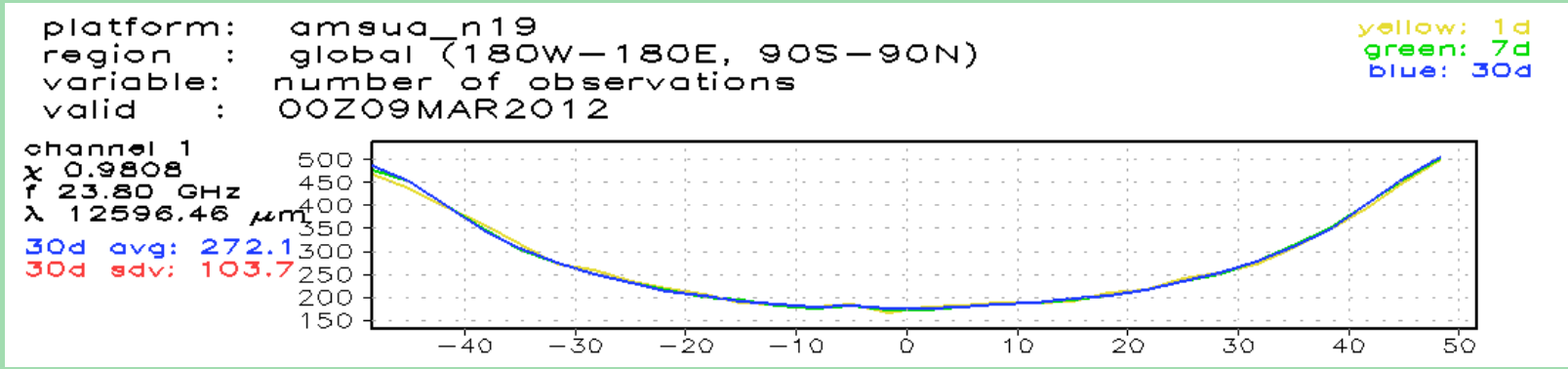


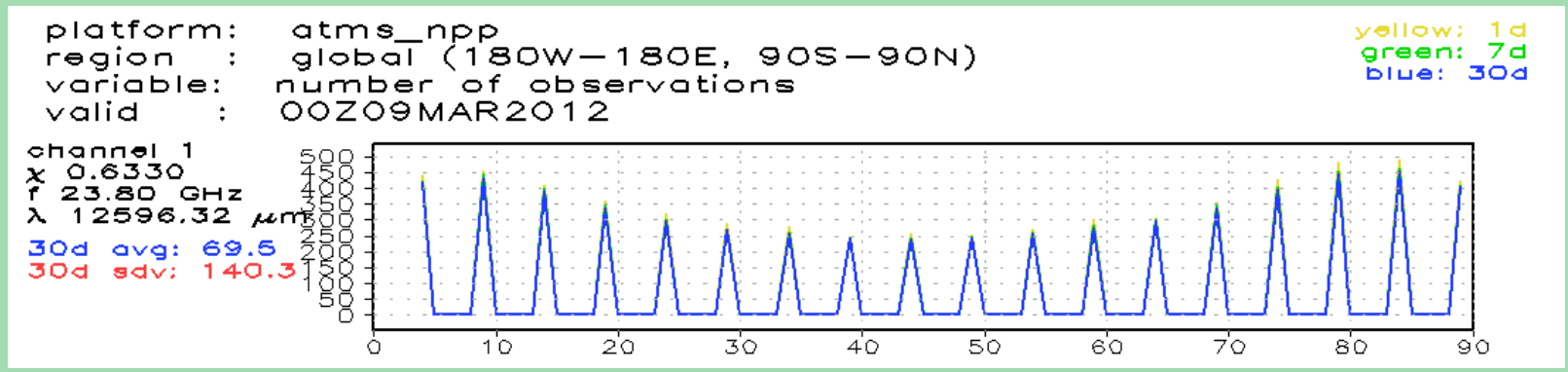
NPP ATMS 23 GHz

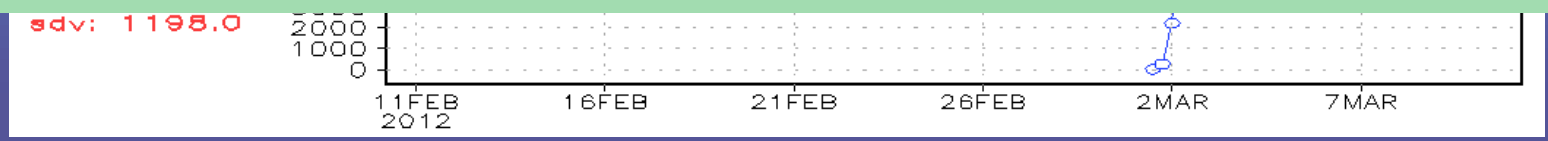


ATMS Observation Count

Obs Count by Scan Position

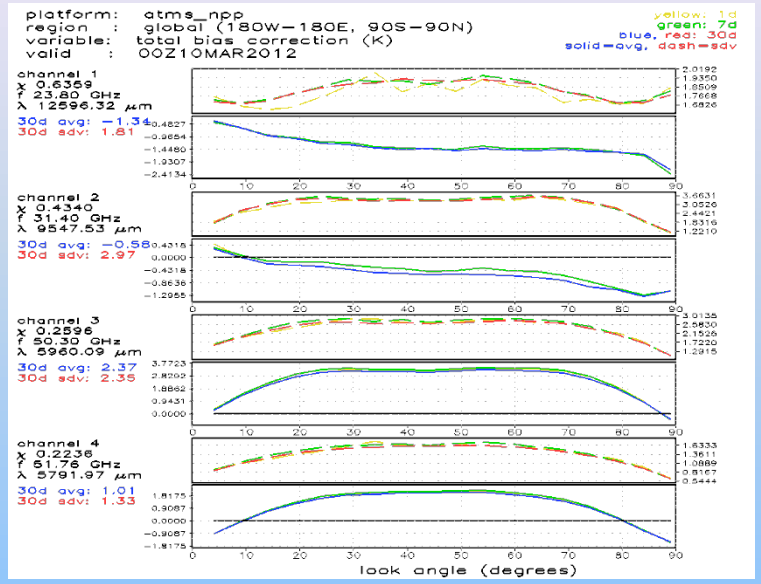




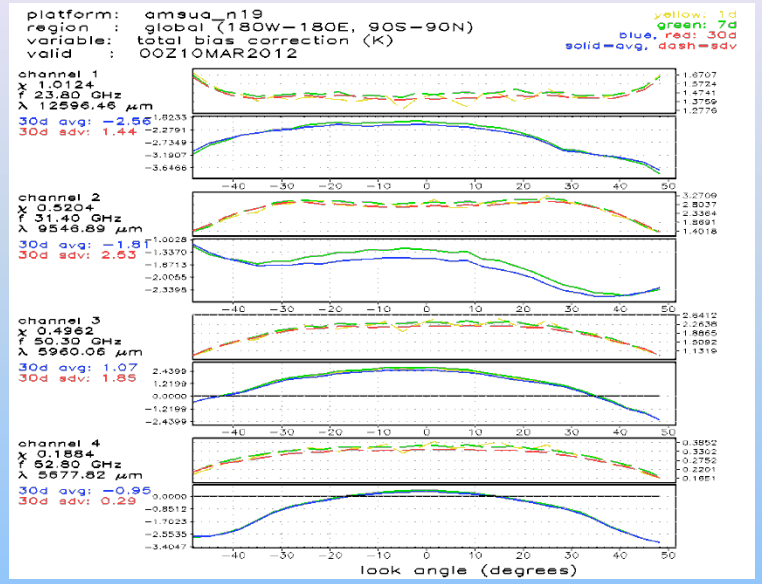


ATMS Bias

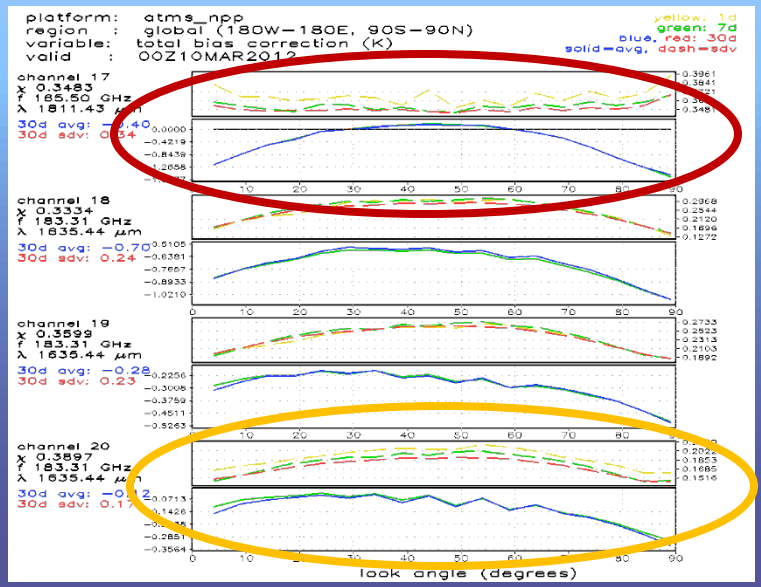
ATMS 1-4



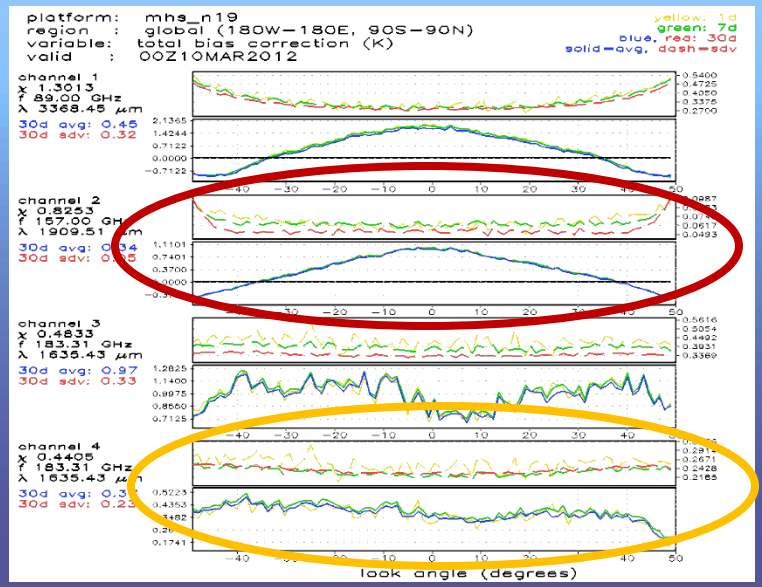
AMSU 1-4



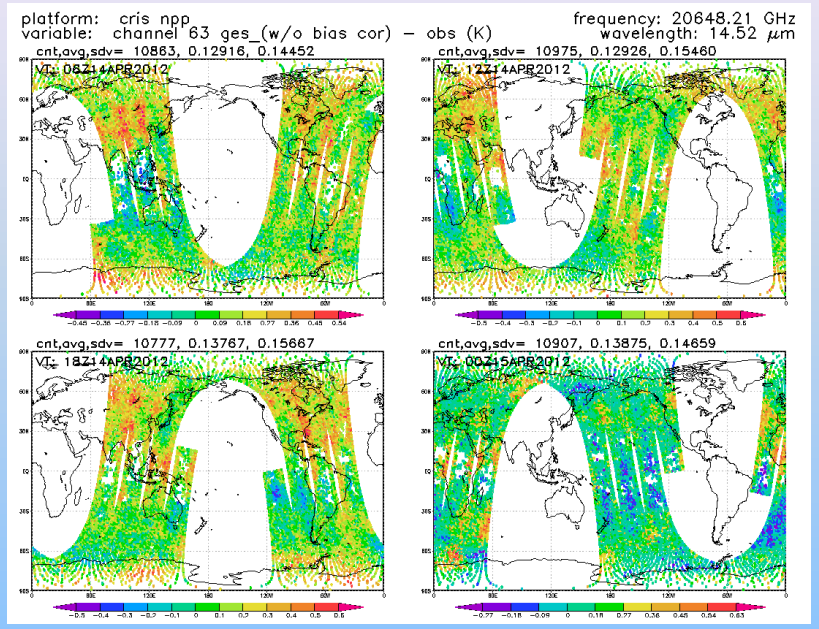
ATMS 17-21

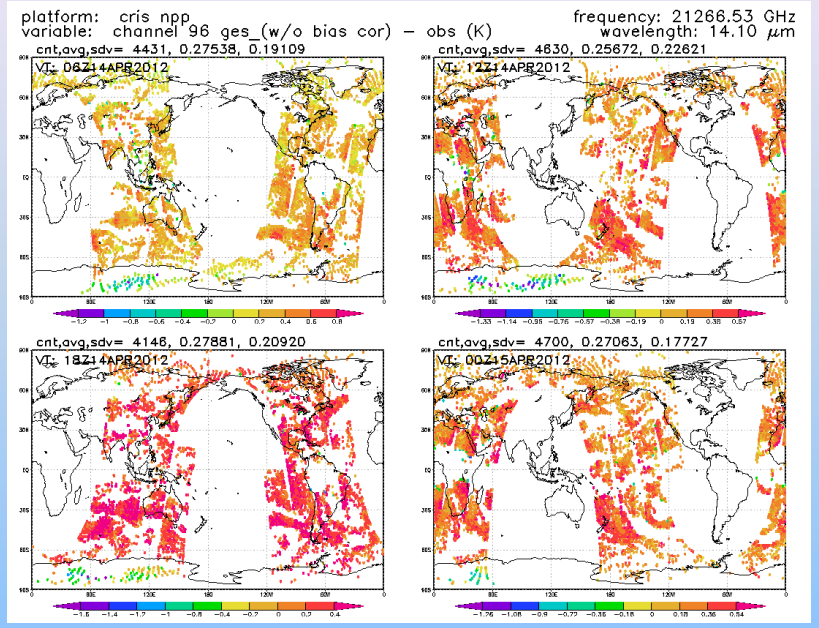


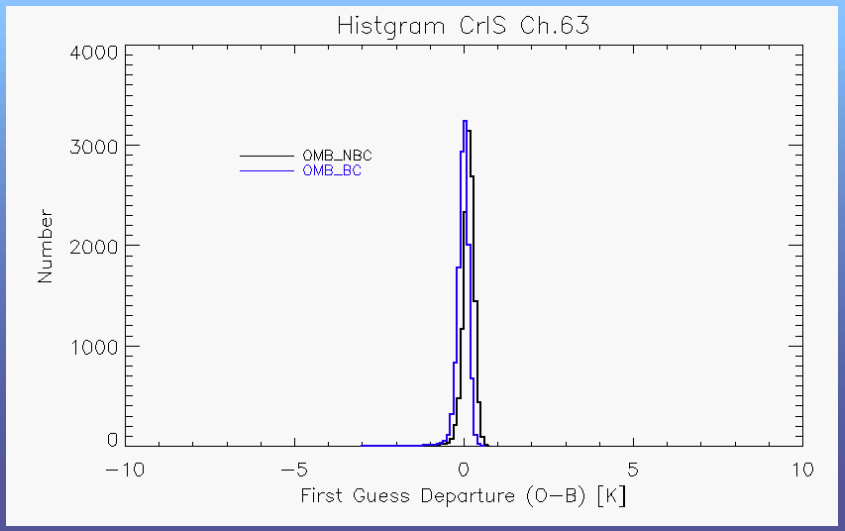
MHS 1-4

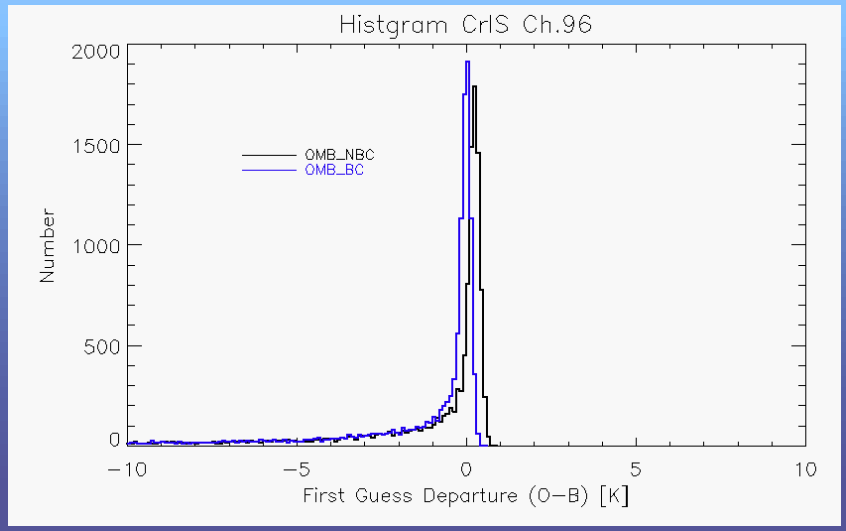


Initial CrIS Assimilation









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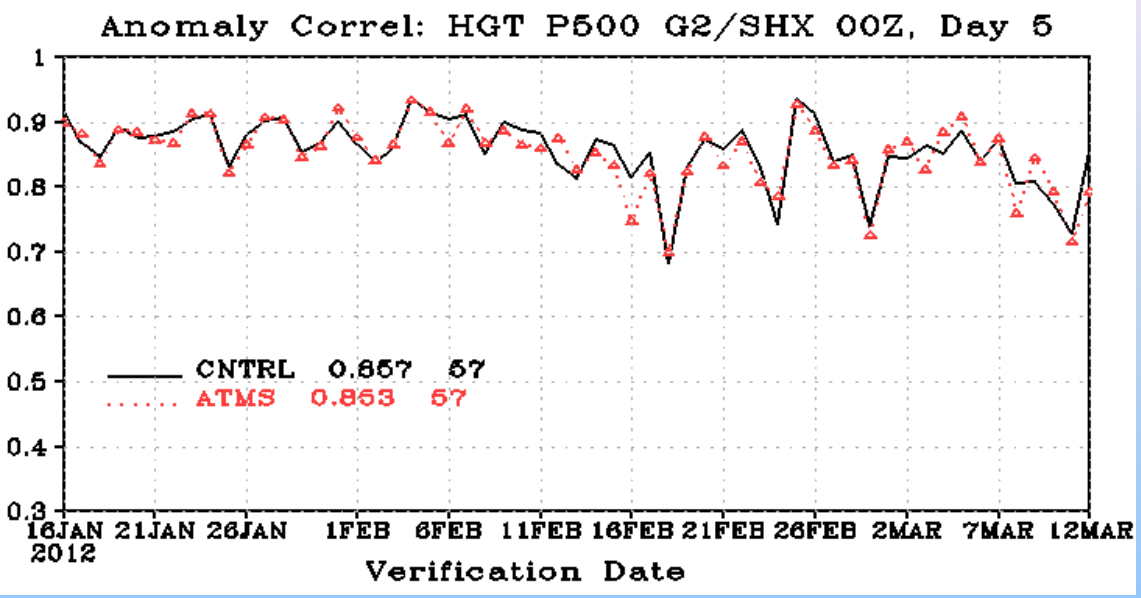
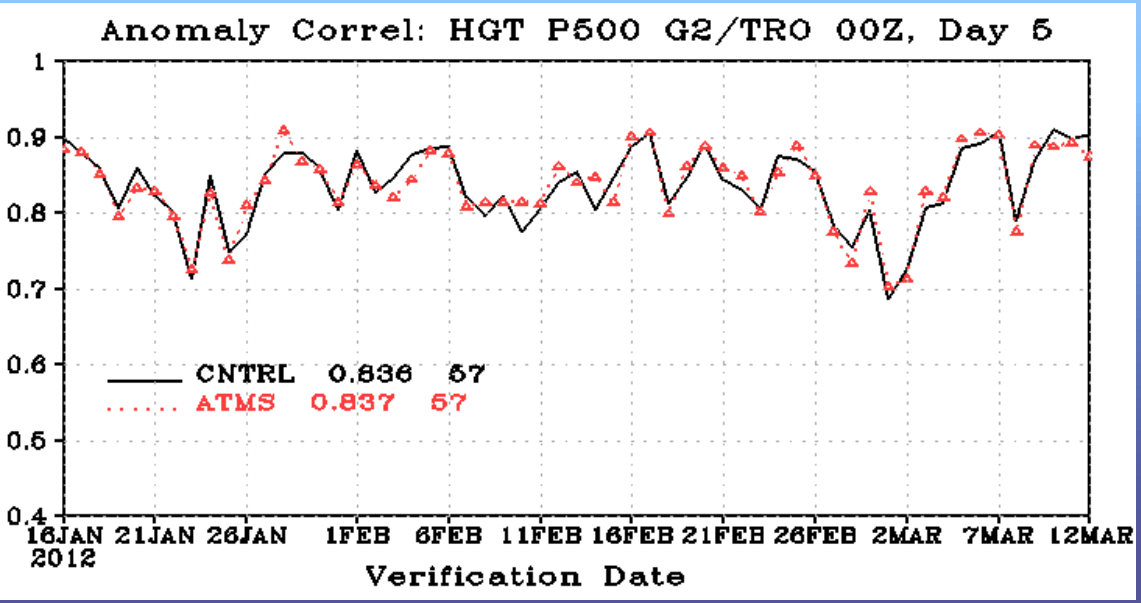
Anomaly Correlation





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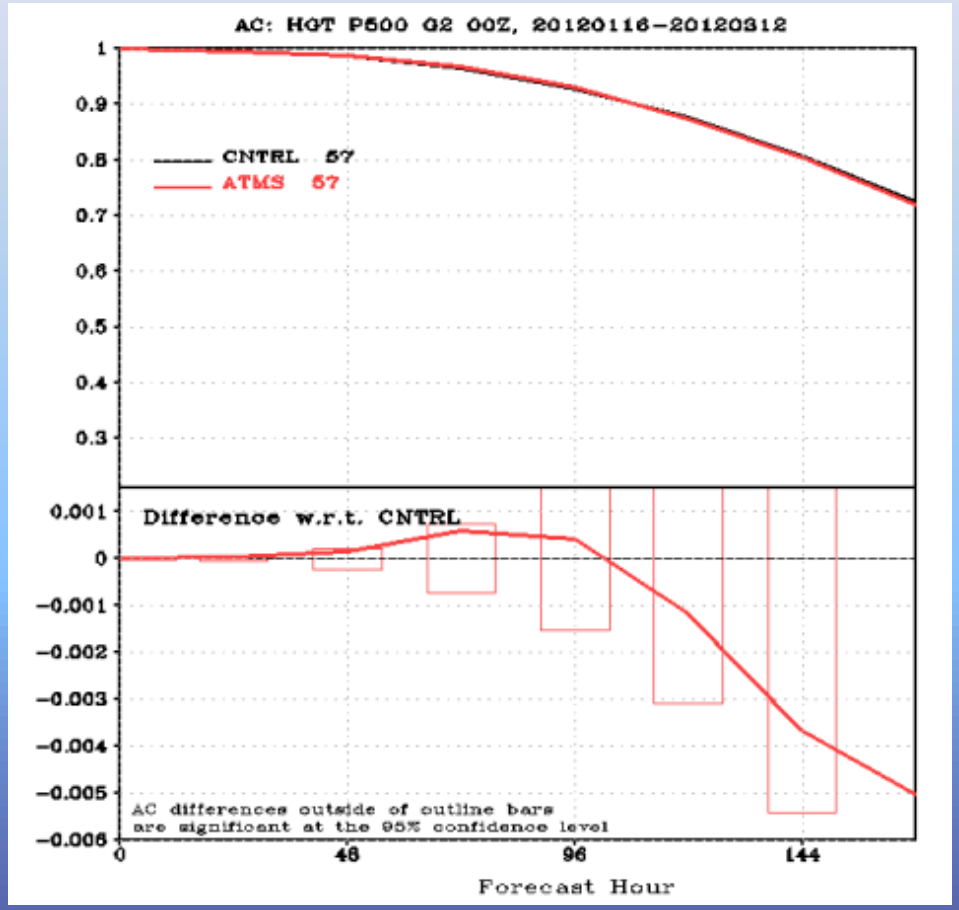
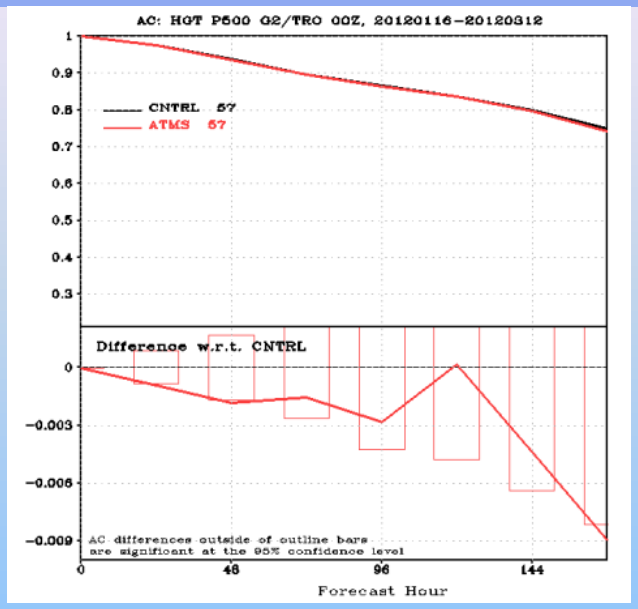
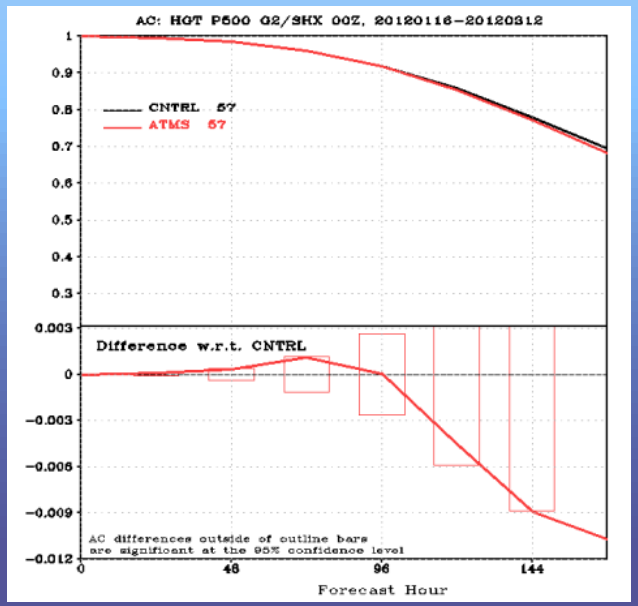
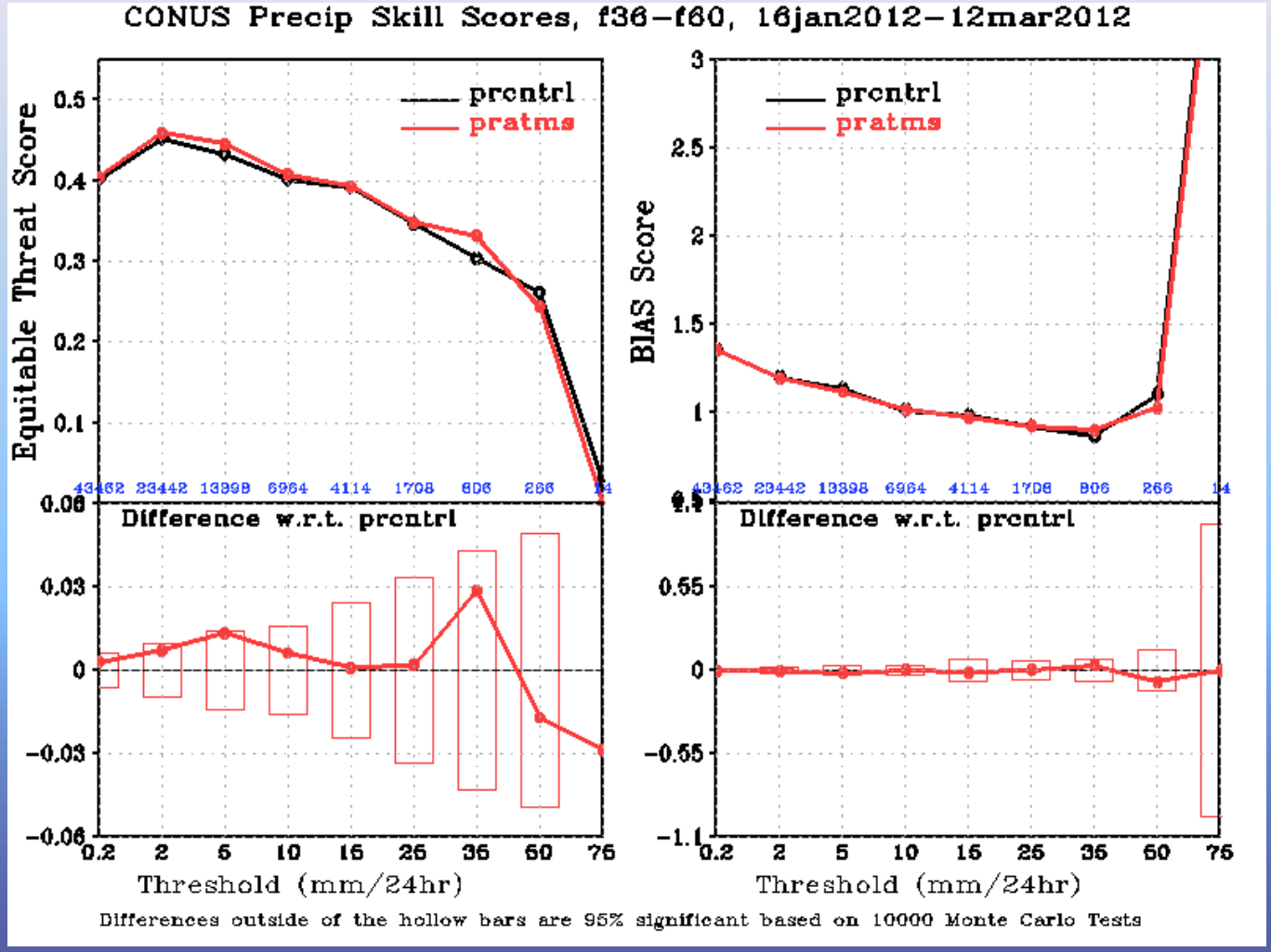






CONUS Precip Scores



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Future Work

- Finalize assessment of ATMS impact from data denial experiment
- Work on alignment of control runs between s4 and CCS (benchmark)
- Assess impact of ATMS replacement of POES/Metop (remove redundancy)
- Work closely with NCEP partners to support successful transition of ATMS into operations
- Coorindate with parallel efforts to assess the overall global observing system and how ATMS fits in
- Coordinate efforts to begin impact assessment of assimilation NOAA products into NOAA models, in collaboration with CIRA (water vapor), CIMMS (temperature sounding), and CREST (surface products)

Summary

- S4 providing resources for OSSEs and data denial experiments (global/regional)
- ATMS data assimilated successfully with neutral impact
- CrIS proxy data successfully assimilated; CrIS real data successfully ingested but needs tuning

Thank you!

Acknowledgements:

John Derber, Andrew Collard, Daryl Kleist (NCEP/EMC)